

EXCAVATION SCENARIO
NON-CARCINOGENS

October 2003

Non-cancer Risk Formula (with volatilization factor):

$$Cs = [(THQ * BWa * AT) / (ED * EF * ((1/RfDo * CF * RAFo * IRSa) + (1/RfDi * IRAa * (1/PEF + 1/VF)) + (1/RfDo * CF * RAFd * DFA)))]$$

C5-C8 ALIPHATICS	
Parameters	Values
Cs (Soil concentration - mg/kg)	103
THQ (Target hazard quotient)	0.125
BWa (Adult body weight - kg; EPA, August 1997)	70
AT (Averaging time - day; EPA, December 1991)	365
ED (Exposure duration - yr; DEQ)	1
EF (Exposure frequency - day/yr; DEQ)	124
RfDo (Chemical specific oral reference dose - mg/kg-day; MADEP, May 2002)	6.00E-02
CF (Conversion factor - kg/mg; EPA, December 1991)	1.E-06
IRSa (Adult soil ingestion rate - mg soil/day; EPA, August 1997)	100
RfDi (Chemical specific inhalation reference dose - mg/kg-day; MADEP, May 2002)	5.70E-02
IRAA (Adult inhalation rate - m^3/day; EPA, August 1997)	20
VF (Volatilization factor - m^3/kg; EPA, May 1996)	1419
PEF (Particulate emission factor - m^3/kg; EPA, May 1996)	1.10E+09
RAFd (Chemical specific dermal relative absorption factor - unitless; MADEP, October 2002)	1
DFa (Adult dermal factor - mg/day; EPA, August 1997)	121

C9-C12 ALIPHATICS	
Parameters	Values
Cs (Soil concentration - mg/kg)	605
THQ (Target hazard quotient)	0.125
BWa (Adult body weight - kg; EPA, August 1997)	70
AT (Averaging time - day; EPA, December 1991)	365
ED (Exposure duration - yr; DEQ)	1
EF (Exposure frequency - day/yr; DEQ)	124
RfDo (Chemical specific oral reference dose - mg/kg-day; MADEP, May 2002)	1.00E-01
CF (Conversion factor - kg/mg; EPA, December 1991)	1.E-06
IRSa (Adult soil ingestion rate - mg soil/day; EPA, August 1997)	100
RfDi (Chemical specific inhalation reference dose - mg/kg-day; MADEP, May 2002)	5.70E-02
IRAA (Adult inhalation rate - m^3/day; EPA, August 1997)	20
VF (Volatilization factor - m^3/kg; EPA, May 1996)	8563
PEF (Particulate emission factor - m^3/kg; EPA, May 1996)	1.10E+09
RAFd (Chemical specific dermal relative absorption factor - unitless; MADEP, October 2002)	0.5
DFa (Adult dermal factor - mg/day; EPA, August 1997)	121

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C9-C10 AROMATICS	
Parameters	Values
Cs (Soil concentration - mg/kg)	94
THQ (Target hazard quotient)	0.125
BWa (Adult body weight - kg; EPA, August 1997)	70
AT (Averaging time - day; EPA, December 1991)	365
ED (Exposure duration - yr; DEQ)	1
EF (Exposure frequency - day/yr; DEQ)	124
RfDo (Chemical specific oral reference dose - mg/kg-day; MADEP, May 2002)	3.00E-02
CF (Conversion factor - kg/mg; EPA, December 1991)	1.E-06
IRSa (Adult soil ingestion rate - mg soil/day; EPA, August 1997)	100
RfDi (Chemical specific inhalation reference dose - mg/kg-day; MADEP, May 2002)	5.70E-03
IRRa (Adult inhalation rate - m^3/day; EPA, August 1997)	20
VF (Volatilization factor - m^3/kg; EPA, May 1996)	13094
PEF (Particulate emission factor - m^3/kg; EPA, May 1996)	1.10E+09
RAFd (Chemical specific dermal relative absorption factor - unitless; MADEP, October 2002)	0.5
DFa (Adult dermal factor - mg/day; EPA, August 1997)	121

C9-C18 ALIPHATICS	
Parameters	Values
Cs (Soil concentration - mg/kg)	1,196
THQ (Target hazard quotient)	0.125
BWa (Adult body weight - kg; EPA, August 1997)	70
AT (Averaging time - day; EPA, December 1991)	365
ED (Exposure duration - yr; DEQ)	1
EF (Exposure frequency - day/yr; DEQ)	124
RfDo (Chemical specific oral reference dose - mg/kg-day; MADEP, May 2002)	1.00E-01
CF (Conversion factor - kg/mg; EPA, December 1991)	1.E-06
IRSa (Adult soil ingestion rate - mg soil/day; EPA, August 1997)	100
RfDi (Chemical specific inhalation reference dose - mg/kg-day; MADEP, May 2002)	5.70E-02
IRRa (Adult inhalation rate - m^3/day; EPA, August 1997)	20
VF (Volatilization factor - m^3/kg; EPA, May 1996)	17605
PEF (Particulate emission factor - m^3/kg; EPA, May 1996)	1.10E+09
RAFd (Chemical specific dermal relative absorption factor - unitless; MADEP, October 2002)	0.5
DFa (Adult dermal factor - mg/day; EPA, August 1997)	121

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C11-C22 AROMATICS	
Parameters	Values
Cs (Soil concentration - mg/kg)	554
THQ (Target hazard quotient)	0.125
BWa (Adult body weight - kg; EPA, August 1997)	70
AT (Averaging time - day; EPA, December 1991)	365
ED (Exposure duration - yr; DEQ)	1
EF (Exposure frequency - day/yr; DEQ)	124
RfDo (Chemical specific oral reference dose - mg/kg-day; MADEP, May 2002)	3.00E-02
CF (Conversion factor - kg/mg; EPA, December 1991)	1.E-06
RAFo (Chemical specific oral relative absorption factor - unitless; MADEP, October 2002)	3.6E-01
IRSa (Adult soil ingestion rate - mg soil/day; EPA, August 1997)	100
RfDi (Chemical specific inhalation reference dose - mg/kg-day; MADEP, May 2002)	5.70E-03
IRRa (Adult inhalation rate - m^3/day; EPA, August 1997)	20
VF (Volatilization factor - m^3/kg; EPA, May 1996)	78193
PEF (Particulate emission factor - m^3/kg; EPA, May 1996)	1.10E+09
RAFd (Chemical specific dermal relative absorption factor - unitless; MADEP, October 2002)	0.1
DFa (Adult dermal factor - mg/day; EPA, August 1997)	121

MTBE	
Parameters	Values
Cs (Soil concentration - mg/kg)	3,670
THQ (Target hazard quotient)	0.125
BWa (Adult body weight - kg; EPA, August 1997)	70
AT (Averaging time - day; EPA, December 1991)	365
ED (Exposure duration - yr; DEQ)	1
EF (Exposure frequency - day/yr; DEQ)	124
RfDo (Chemical specific oral reference dose - mg/kg-day; EPAIX, October 2002)	3.30E-02
CF (Conversion factor - kg/mg; EPA, December 1991)	1.E-06
IRSa (Adult soil ingestion rate - mg soil/day; EPA, August 1997)	100
RfDi (Chemical specific inhalation reference dose - mg/kg-day; IRIS, September 2003)	8.57E-01
IRRa (Adult inhalation rate - m^3/day; EPA, August 1997)	20
VF (Volatilization factor - m^3/kg; EPA, May 1996)	6018
PEF (Particulate emission factor - m^3/kg; EPA, May 1996)	1.10E+09
RAFd (Chemical specific dermal relative absorption factor - unitless; EPAIII, Dec. 1995)	0.03
DFa (Adult dermal factor - mg/day; EPA, August 1997)	121

EXCAVATION SCENARIO
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TOLUENE	
Parameters	Values
Cs (Soil concentration - mg/kg)	576
THQ (Target hazard quotient)	0.125
BWa (Adult body weight - kg; EPA, August 1997)	70
AT (Averaging time - day; EPA, December 1991)	365
ED (Exposure duration - yr; DEQ)	1
EF (Exposure frequency - day/yr; DEQ)	124
RfDo (Chemical specific oral reference dose - mg/kg-day; IRIS, September 2003)	2.00E-01
CF (Conversion factor - kg/mg; EPA, December 1991)	1.E-06
IRSa (Adult soil ingestion rate - mg soil/day; EPA, August 1997)	100
RfDi (Chemical specific inhalation reference dose - mg/kg-day; IRIS, September 2003)	1.14E-01
IRRa (Adult inhalation rate - m^3/day; EPA, August 1997)	20
VF (Volatilization factor - m^3/kg; EPA, May 1996)	3971
PEF (Particulate emission factor - m^3/kg; EPA, May 1996)	1.10E+09
RAFd (Chemical specific dermal relative absorption factor - unitless; EPAIII, Dec. 1995)	0.03
DFa (Adult dermal factor - mg/day; EPA, August 1997)	121

ETHYLBENZENE	
Parameters	Values
Cs (Soil concentration - mg/kg)	1,586
THQ (Target hazard quotient)	0.125
BWa (Adult body weight - kg; EPA, August 1997)	70
AT (Averaging time - day; EPA, December 1991)	365
ED (Exposure duration - yr; DEQ)	1
EF (Exposure frequency - day/yr; DEQ)	124
RfDo (Chemical specific oral reference dose - mg/kg-day; IRIS, September 2003)	1.00E-01
CF (Conversion factor - kg/mg; EPA, December 1991)	1.E-06
IRSa (Adult soil ingestion rate - mg soil/day; EPA, August 1997)	100
RfDi (Chemical specific inhalation reference dose - mg/kg-day; IRIS, September 2003)	2.86E-01
IRRa (Adult inhalation rate - m^3/day; EPA, August 1997)	20
VF (Volatilization factor - m^3/kg; EPA, May 1996)	4601
PEF (Particulate emission factor - m^3/kg; EPA, May 1996)	1.10E+09
RAFd (Chemical specific dermal relative absorption factor - unitless; EPAIII, Dec. 1995)	0.03
DFa (Adult dermal factor - mg/day; EPA, August 1997)	121

EXCAVATION SCENARIO
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XYLENES	
Parameters	Values
Cs (Soil concentration - mg/kg)	160
THQ (Target hazard quotient)	0.125
BWa (Adult body weight - kg; EPA, August 1997)	70
AT (Averaging time - day; EPA, December 1991)	365
ED (Exposure duration - yr; DEQ)	1
EF (Exposure frequency - day/yr; DEQ)	124
RfDo (Chemical specific oral reference dose - mg/kg-day; IRIS, September 2003)	2.00E-01
CF (Conversion factor - kg/mg; EPA, December 1991)	1.E-06
IRSa (Adult soil ingestion rate - mg soil/day; EPA, August 1997)	100
RfDi (Chemical specific inhalation reference dose - mg/kg-day; IRIS, September 2003)	2.90E-02
IRRa (Adult inhalation rate - m^3/day; EPA, August 1997)	20
VF (Volatilization factor - m^3/kg; EPA, May 1996)	4302
PEF (Particulate emission factor - m^3/kg; EPA, May 1996)	1.10E+09
RAFd (Chemical specific dermal relative absorption factor - unitless; EPAIII, Dec. 1995)	0.03
DFa (Adult dermal factor - mg/day; EPA, August 1997)	121

Non-cancer Risk Formula (without volatilization factor):

$$Cs = [(THQ * BWa * AT) / (ED * EF * ((1 / RfDo * CF * IRSa) + (1 / RfDo * IRAa * 1 / PEF) + (1 / RfDo * CF * RAFd * DFa)))]$$

C19-C36 ALIPHATICS	
Parameters	Values
Cs (Soil concentration - mg/kg)	459,445
THQ (Target hazard quotient)	0.125
BWa (Adult body weight - kg; EPA, August 1997)	70
AT (Averaging time - day; EPA, December 1991)	365
ED (Exposure duration - yr; DEQ)	1
EF (Exposure frequency - day/yr; DEQ)	124
RfDo (Chemical specific oral reference dose - mg/kg-day; MADEP, May 2002)	2.00E+00
CF (Conversion factor - kg/mg; EPA, December 1991)	1.E-06
IRSa (Adult soil ingestion rate - mg soil/day; EPA, August 1997)	100
IRRa (Adult inhalation rate - m^3/day; EPA, August 1997)	20
PEF (Particulate emission factor - m^3/kg; EPA, May 1996)	1.10E+09
RAFd (Chemical specific dermal relative absorption factor - unitless; MADEP, October 2002)	0.1
DFa (Adult dermal factor - mg/day; EPA, August 1997)	121

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NAPHTHALENE	
Parameters	Values
Cs (Soil concentration - mg/kg)	4,578
THQ (Target hazard quotient)	0.125
BWa (Adult body weight - kg; EPA, August 1997)	70
AT (Averaging time - day; EPA, December 1991)	365
ED (Exposure duration - yr; DEQ)	1
EF (Exposure frequency - day/yr; DEQ)	124
RfDo (Chemical specific oral reference dose - mg/kg-day; IRIS, September 2003)	2.00E-02
CF (Conversion factor - kg/mg; EPA, December 1991)	1.E-06
RfDi (Chemical specific inhalation reference dose - mg/kg-day; IRIS, September 2003)	9.E-04
IRSa (Adult soil ingestion rate - mg soil/day; EPA, August 1997)	100
IRRa (Adult inhalation rate - m^3/day; EPA, August 1997)	20
PEF (Particulate emission factor - m^3/kg; EPA, May 1996)	1.10E+09
RAFd (Chemical specific dermal relative absorption factor - unitless; EPAIII, Dec. 1995)	0.1
DFa (Adult dermal factor - mg/day; EPA, August 1997)	121

ANTHRACENE	
Parameters	Values
Cs (Soil concentration - mg/kg)	68,917
THQ (Target hazard quotient)	0.125
BWa (Adult body weight - kg; EPA, August 1997)	70
AT (Averaging time - day; EPA, December 1991)	365
ED (Exposure duration - yr; DEQ)	1
EF (Exposure frequency - day/yr; DEQ)	124
RfDo (Chemical specific oral reference dose - mg/kg-day; IRIS, September 2003)	3.00E-01
CF (Conversion factor - kg/mg; EPA, December 1991)	1.E-06
IRSa (Adult soil ingestion rate - mg soil/day; EPA, August 1997)	100
IRRa (Adult inhalation rate - m^3/day; EPA, August 1997)	20
PEF (Particulate emission factor - m^3/kg; EPA, May 1996)	1.10E+09
RAFd (Chemical specific dermal relative absorption factor - unitless; EPAIII, Dec. 1995)	0.1
DFa (Adult dermal factor - mg/day; EPA, August 1997)	121

ACENAPHTHENE	
Parameters	Values
Cs (Soil concentration - mg/kg)	13,783
THQ (Target hazard quotient)	0.125
BWa (Adult body weight - kg; EPA, August 1997)	70
AT (Averaging time - day; EPA, December 1991)	365
ED (Exposure duration - yr; DEQ)	1
EF (Exposure frequency - day/yr; DEQ)	124
RfDo (Chemical specific oral reference dose - mg/kg-day; IRIS, September 2003)	6.00E-02
CF (Conversion factor - kg/mg; EPA, December 1991)	1.E-06
IRSa (Adult soil ingestion rate - mg soil/day; EPA, August 1997)	100
IRRa (Adult inhalation rate - m^3/day; EPA, August 1997)	20
PEF (Particulate emission factor - m^3/kg; EPA, May 1996)	1.10E+09
RAFd (Chemical specific dermal relative absorption factor - unitless; EPAIII, Dec. 1995)	0.1
DFa (Adult dermal factor - mg/day; EPA, August 1997)	121

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FLUORANTHENE	
Parameters	Values
Cs (Soil concentration - mg/kg)	9,189
THQ (Target hazard quotient)	0.125
BWa (Adult body weight - kg; EPA, August 1997)	70
AT (Averaging time - day; EPA, December 1991)	365
ED (Exposure duration - yr; DEQ)	1
EF (Exposure frequency - day/yr; DEQ)	124
RfDo (Chemical specific oral reference dose - mg/kg-day; IRIS, September 2003)	4.00E-02
CF (Conversion factor - kg/mg; EPA, December 1991)	1.E-06
IRSa (Adult soil ingestion rate - mg soil/day; EPA, August 1997)	100
IRRa (Adult inhalation rate - m^3/day; EPA, August 1997)	20
PEF (Particulate emission factor - m^3/kg; EPA, May 1996)	1.10E+09
RAFd (Chemical specific dermal relative absorption factor - unitless; EPAIII, Dec. 1995)	0.1
DFa (Adult dermal factor - mg/day; EPA, August 1997)	121

FLUORENE	
Parameters	Values
Cs (Soil concentration - mg/kg)	9,189
THQ (Target hazard quotient)	0.125
BWa (Adult body weight - kg; EPA, August 1997)	70
AT (Averaging time - day; EPA, December 1991)	365
ED (Exposure duration - yr; DEQ)	1
EF (Exposure frequency - day/yr; DEQ)	124
RfDo (Chemical specific oral reference dose - mg/kg-day; IRIS, September 2003)	4.00E-02
CF (Conversion factor - kg/mg; EPA, December 1991)	1.E-06
IRSa (Adult soil ingestion rate - mg soil/day; EPA, August 1997)	100
IRRa (Adult inhalation rate - m^3/day; EPA, August 1997)	20
PEF (Particulate emission factor - m^3/kg; EPA, May 1996)	1.10E+09
RAFd (Chemical specific dermal relative absorption factor - unitless; EPAIII, Dec. 1995)	0.1
DFa (Adult dermal factor - mg/day; EPA, August 1997)	121

PYRENE	
Parameters	Values
Cs (Soil concentration - mg/kg)	6,892
THQ (Target hazard quotient)	0.125
BWa (Adult body weight - kg; EPA, August 1997)	70
AT (Averaging time - day; EPA, December 1991)	365
ED (Exposure duration - yr; DEQ)	1
EF (Exposure frequency - day/yr; DEQ)	124
RfDo (Chemical specific oral reference dose - mg/kg-day; IRIS, September 2003)	3.00E-02
CF (Conversion factor - kg/mg; EPA, December 1991)	1.E-06
IRSa (Adult soil ingestion rate - mg soil/day; EPA, August 1997)	100
IRRa (Adult inhalation rate - m^3/day; EPA, August 1997)	20
PEF (Particulate emission factor - m^3/kg; EPA, May 1996)	1.10E+09
RAFd (Chemical specific dermal relative absorption factor - unitless; EPAIII, Dec. 1995)	0.1
DFa (Adult dermal factor - mg/day; EPA, August 1997)	121